

CITY OF BERKELEY

City Planning Department
Martin Luther King, Jr. Civic Center Building
2180 Milvia Street - 2nd Floor
Berkeley, California 94704



(510) 644-6534 • (510) 644-6490 • TDD (510) 644-6915 • FAX (510) 644-8678

April 7, 1994

To: Interested Members of the Community

From: City of Berkeley Traffic Engineering and Planning Staff

Subject: TJKM REPORT ON THE BERKELEY BIKE PLAN

INSTITUTE OF GOVERNMENTAL
STUDIES LIBRARY

OCT 20 1994

UNIVERSITY OF CALIFORNIA

In 1993 the City began a process to develop a strategic plan for specific and near term bicycle improvements in West Berkeley and city-wide. The effort was funded by the Miles Development Agreement which allowed the City to retain a consulting team to work with members of the community and staff to develop a plan. The primary goal was to find ways to make Berkeley a truly bike friendly city.

Working from information from current cyclists, the consultants' own reconnaissance, and the experience of other cities, the consulting team on this project has recommended an extensive array of improvements and changes in the City's existing bikeways policies and network. Some of these changes can be easily implemented in the near term, while others may take longer because of funding issues. For example, a number of traffic signals have been recommended which represent an investment which would take many years to realize. Other proposals have implications which will require broad debate. For example, adopting standards for bike lane widths suggested in the report would probably make bike lanes impossible on most of Berkeley's relatively narrow streets.

But beyond these issues which will need further resolution, some significant elements stand out which will truly set a new direction for bicycling in Berkeley. The following seem to be the most critical elements of a new vision for Berkeley that have a broad consensus among staff, consultants, and member of the cycling community who have participated so far:

KEY CHANGES FOR A BIKE FRIENDLY BERKELEY

POLICIES

- **Bicycle Boulevards:** The City should designate several strategically located north-south and east-west routes as bike boulevards. Although "bike boulevard" is not a legal bikeway standard, it has come to mean a bikeway which receives intensive treatment to make it a route where the needs of cyclists are met, even to the disadvantage of motorists. The consultants have suggested a number of routes for bike boulevard treatment. Some routes suggested by the community may be added. The exact routes chosen and the treatments for them will require further planning.

- Street Paving and Sweeping:** Revise the City's street paving and sweeping policies to ensure that all bikeway surfaces are safe to ride. Make sure that striping and signage are maintained.
- Signalization:** Where bikeways intersect major and collector streets, provide for greater bike convenience, safety, and visibility through innovative measures such as special striping, signal timing, installation of bike sensitive loops, and bike/ped activated signals.
- Design Standards for "Class 2-1/2":** The policy is suggested by staff in response to the consultant report. We believe that the consultant report implies the need for a treatment which is "stronger" than the simple signage of a bike route (Class 3) on roads where the width of the right of way makes adequate bike lanes (Class 2) impossible. The treatment might include special signage or pavement markings. We invite the cycling community to help design standards for "Class 2-1/2".
- Budget:** This plan calls for the implementation of many major and minor physical projects. In order to accomplish this staff believes that a dependable budget for bicycle projects over a period of years is essential. This would be in addition to funds acquired through grant programs, because many of the types of projects suggested here are not eligible for state and federal grant programs.

PROGRAMS

- Education:** Establish on-going education programs which might include training for new cyclists, traffic court instruction for motorists and cyclists, development of maps and other instructional materials, development, distribution of bike oriented commuter guides to employees in the City of Berkeley, and peer examples.

PROJECTS

- Near-term improvements:** Prioritize the list of over 150 specific projects developed by the consultants and begin implementation concentrating on low-cost projects benefitting the greatest number of cyclists.
- Grants:** Develop and maintain up to date proposals and plans for several larger capital projects suitable for submitting for competitive state or national funding programs; aggressively seek grants.

EARLY IMPLEMENTATION

One major goal of this planning project was to develop a limited number of projects in sufficient detail for use in funding applications. Although progress on the plan has been slow, it has not prevented us from submitting applications based on the information we developed for the plan. Three major grant applications resulted:

Bicycle Parking: The City applied for and was awarded \$100,000 for installation of secure bicycle parking facilities city-wide, to be implemented in 1994/95.

Bicycle Signal: Safe crossing of bike routes at major streets was identified as a priority by many participants in this plan. Signals are desirable at a number of intersections. At the same time, residents of bike routes often oppose signals because they fear that additional automobile traffic would be attracted to the crossing and intrude into the neighborhood. Palo Alto has solved this problem with the installation of "bicycle-pedestrian signals" which stop the traffic for cyclists or walkers, but prevent through automobile traffic. The City of Berkeley has applied to the Transportation Development Act program for funding for such a signal at Channing/M.L.K.

Bike Bridge: There is now no good way to get from the Berkeley "mainland" to the waterfront, even though the Bay Trail Bicycle Path will soon be constructed on the west side of the I-80 freeway. A good connection crossing I-80 to the waterfront was a priority with many participants in the initial workshop for this plan. The City has developed an application for this project and so far has submitted it to the Transportation Enhancement Activities Program. We have also organized extensive support for this project from other agencies, legislators, and environmental and community groups. Although this project has not yet been funded, we are confident that it soon will be as its merits are universally recognized.

Workshop participants also identified the need for better access to and across the U.C. Campus as vital. This became even more of a priority when U.C. closed many paths to cyclists in 1993. The City has responded by assigning a member of the planning staff to participate in U.C.'s bicycle planning. Already members of the cycling community and the City have influenced U.C. to moderate its position.

NEXT STEPS

We ask that you review this draft plan with especial attention to the many specific suggestions for projects large and small. The City will be holding a series of workshops to take suggestions and corrections and to discuss the many issues the plan raises. For a schedule of workshops or to send written comments contact:

Susan Sanderson
Planning Department
City of Berkeley
2180 Milvia
Berkeley, CA 94704
Phone: 644-6490
E-Mail: sus1@ci.berkeley.ca.us
FAX: 644-8678

DRAFT

BERKELEY BICYCLE PLAN TO CREATE A MORE BICYCLE-FRIENDLY CITY

INTRODUCTION

This report results from a bicycle planning project during which the City of Berkeley retained a consulting team headed by TJKM Transportation Consultants and including Brady and Associates and Alan Wachtel to develop and refine bicycle plans that will make Berkeley a more bicycle-friendly city and promote bicycling as a desirable, safe, and practical means of transportation. This project is the first phase of what is anticipated as a two-phase effort to develop and refine bicycle plans for the City of Berkeley.

This first phase focuses on an overall evaluation of existing bikeways and bicycling opportunities in Berkeley, including identification of specific problems and preliminary suggestions for solutions and/or alternative routes. The second phase will be conducted as part of the revision of the City's Master Plan and circulation element, to begin this summer. During the second phase the City's existing overall bicycle goals and policies, as specified in the 1977 General Plan, will be re-evaluated and new ones developed. The General Plan revision will also be the appropriate time to make a decision about proposals which make significant changes in the City's circulation system.

SUMMARY

The first section of this report, **Background and Goals**, sets the context for the report and defines a few broad goals which guided the effort to develop strategies for enhancing the bicycle network and encouraging safe cycling. The second section, **Bicycle Policies**, discusses bicycle policies in the areas of bikeway standards, parking, ancillary facilities, a bikeway map, and public awareness and feedback programs that the City could adopt to ensure a good cycling environment. The third section, **Implementation**, provides an extensive and detailed list of potential improvements including those for bikeways, major projects, curb cuts, rail crossings, traffic signals, stop signs, diverters, striping, lighting, parking and paving improvements. The **Appendices** include maps and some draft solutions to particular intersection or diverter design.

Staff Comment: This report has largely been authored by the consulting team with some editing and formatting by City staff. Where City of Berkeley staff have identified important issues, problems, or opportunities associated with the recommendations in the report, boxed comments like this have been inserted. City staff anticipates revising this report based on feedback received in the next month.

BACKGROUND AND GOALS

Berkeley is a bicycling community. Almost 4000 people bike to work in Berkeley everyday in addition to those who use bikes for pleasure or errands, or children who ride bike. Many of the more than 40,000 students at the University of California and other schools in Berkeley use bicycles as their primary means of transportation. In addition, Berkeley is a center for urban recreational cyclists.

Despite the high level of cycling that currently exists in the City, conditions should be improved. As an older community which was mostly built up before World War II, Berkeley's streets system is composed mainly of 36-foot wide streets. Assuming two lanes of moving traffic in each direction and parking on each side, there is insufficient room for striping useful bike lanes on most Berkeley streets. There are only a few bicycle paths in the City completely separated from the street system. While there are some opportunities for expanding the number of dedicated bicycle paths, the built-out nature of the City precludes easy development a complete system of such paths.

Because of the City's built up nature and its narrow streets, most bicycle traffic mixes directly with auto traffic. Consequently, the greatest opportunity for near-term bikeway improvements lies in repaving, restriping and modifying traffic control on the city's many mixed-traffic streets to better accommodate bicyclists. There are already some trends in this direction. Beginning in the 1960s and 1970s residential traffic control has removed much auto traffic from residential streets and concentrated it on the City's major thoroughfares and commercial streets. Although this has improved many streets for cycling, it has made riding on and crossing major streets more difficult for experienced riders and more daunting for new or potential riders.

Furthermore, although the intrusiveness of auto traffic has been reduced via diverters and other measures such as residential permit parking and stop signs, residential traffic control in Berkeley is not an unmitigated boon for cycling. Diverters are not always easily traversed by bicycles -- diagonal diverters in particular, since left-turning motorists often disregard the possibility of a cyclist passing through the barrier into their path of travel. Stop signs, a common if controversial tool in residential traffic control, are generally anathema to cyclists, since stopping means loss of momentum as well as time.

To improve cycling in Berkeley, this project had goals on several levels. Short and long term goals included:

- the development of a strategic list of projects which would have the potential to encourage greater use of cycling for purposeful trips,
- to develop conceptual plans for bicycle facility improvement projects, which could then compete for funding from state and federal funding sources,
- to find ways to change Berkeley into a truly bicycle-friendly community.

The project was guided by suggestions and comments from interested members of the community, via the study advisory group and the general public. Information on commonly used routes, and ideas on existing problems and potential solutions were specifically solicited at and subsequent to a February, 1993 public workshop attended by nearly one hundred people. The strategies developed were heavily influenced by the kinds of problems cited in the following summary--which pointed toward correcting deficiencies in the existing system, rather than developing a whole new network.

SUMMARY OF FINDINGS: PUBLIC WORKSHOP 1 AND EARTHDAY PUBLIC SURVEY

TJKM compiled information from the February 27, 1993 workshop and subsequent mail-ins, and a public survey conducted during Earthday (April 24) 1993. The following summarizes the most commonly cited problems. The number of times specific problems were cited are shown next to each problem description. TJKM used this response

rate to provide an initial sense of prioritization. This method is not conclusive. It will need subsequent refinement because there are other sources of information such as accident reports that must be considered.

Overview of Problems

Individual problems and suggestions were organized under sub-groups. The response rate for problems cited was noted next to these sub-group headings and the individual problems described under these. All sub-groups and individual problems with six or more responses are reproduced below in descending order of response:

Lack of/ Problems with, Lanes on Key Routes (59 total responses)

Problems included the lack of bicycle access, especially through the U.C. Berkeley campus and to the Marina (8), and the lack of continuous routes through Berkeley (9). Good north-south, east-west, and diagonal main-line routes are needed. Street diverters are not comfortably permeable by cyclists and not safe either since vehicles shoot by them without expecting cyclists to appear through them (8). One-way streets are a problem since two-way cyclists end up in reverse direction to traffic, or confused about how to react and continue on such a street after turning from another street (6). There was a dissent on this, a smaller group of respondents liked one-way streets. "Slow" streets also present pros and cons to cyclists with the majority against them. Two problem is that the wavy curves are hard to see or predict at night and bumps encourage motorists to drive in the bicycle lanes to partially avoid them. A number of responses (14) pointed out problems along roadways without specifying the exact nature.

Intersections/Crossings/Connections (54)

The most oft-cited problems were that crossing is difficult or hard to follow (12 responses) and that there are too many Stop signs (12). Problems ranged from lack of signs or signals to help cross, auto drivers cutting in too close to the curb, and drivers not heeding cyclists because of poor design (includes bike lanes petering out), as well as bad attitudes or education. Juxtaposed or off-set intersections are especially difficult to deal with and are dangerous. Handling them is unclear to both cyclists and drivers. The number of Stop signs is a problem because it takes time and energy for a cyclist to pick up speed again.

Pavement (44)

Most complaints were related to the potholes, ripples and patchwork repairs on roadway pavements (38). Bikes suffer undue wear and tear and there is personal danger when bike-wheels run into wheel-sized ruts.

Dangerous Motorists/Stupid cyclists (43)

Cyclists said that motorists act aggressive, dangerous, uneducated and unaccustomed to cyclists. (18)

Bike Security and Facilities (34)

Most oft-cited was the need for secure parking (19) and sufficient supply of parking. (12)

High-Volume and/or narrow streets (21)

Most problems were generally cited as the heading suggests. (17) Emphasis seems to be on safety problems. Roads are too narrow to comfortably accommodate parking on both sides as well as bike lanes. Problems are exacerbated where vehicles speed.

Car Parking (17)

The biggest problem was the hazard of car doors opening in the cyclists' paths. (6)

Local/Regional Access (14)

No specific problems got cited six or more times. The biggest problem was access to and from Berkeley from other regions via BART and buses during commute times, and via roads, bridges and narrow tunnels. Also cited were access from the stations to other areas of Berkeley, and finally, access to Berkeley's parks and the Marina.

Crossing arterials (13)

Most commonly cited was the need for access to the waterfront. (11)

Signal Timing/Actuation (12)

The biggest problem is that bicycles are not heavy enough to actuate traffic signals and must either wait for a vehicle or run the light. (9)

Poor Lighting (11)

Most responses did not provide more description.

The remaining problems with fewer than six total complaints were: Orientation (signs), Crime, Debris, Inadequate City Policies, Disincentives for cycling (types of errands that require auto use etc., and Others.

BICYCLE POLICIES

BIKEWAY STANDARDS

Considered a vehicle under California law, bicycles have the right to responsible use of virtually all roadway facilities in Berkeley except for the Interstate 80 freeway. Most roadways will never be designated as bikeway facilities, but most will at least occasionally be used by cyclists. As an overall goal, the City should ensure that all streets meet minimal safety characteristics for cyclists.

However, there is a place for designated bikeways within Berkeley. Designating bikeways is not meant to segregate cyclists, but to provide relatively safer and more pleasant routes for cyclists. Bikeways are especially helpful for beginning cyclists who are unaccustomed to riding in heavy auto traffic. By providing routes insulated to some extent from auto traffic, they also facilitate longer "cross-town" tripmaking by all cyclists. Although Berkeley adopted and implemented a bikeways system in the mid-1970's the City has not adopted specific standards for the three types of bike facilities: Classes 1, 2, and 3. Bikeways in Berkeley should conform to the following standards.

Bike Paths (Class 1)

Bike paths are dedicated bikeways on which no automobile traffic is allowed. Special care must be taken in the design where there are conflicts with auto crossings. Bike paths should have the following characteristics:

- Total minimum width of eight feet (12 feet desirable), allowing at least four feet in each direction of travel.
- Physical separation from any parallel automobile traffic is desirable to avoid conflicts with traffic at intersections and driveways. Separation from pedestrian traffic is also theoretically desirable; however, since bike paths in practice usually attract pedestrians, a 12-foot bike path is desirable. (12 feet is also desirable because of the size of maintenance vehicles. The edges of bike paths tend to get cracked by the maintenance vehicles if they are narrower than 12-feet.
- Relatively straight alignment, with good visibility and smooth turning radii for bicyclists.

Bike Lanes (Class 2)

Bike lanes are marked lanes for bicycles on local, collector and major (arterial) streets. They are appropriate for streets with moderate (or more) traffic that are designated bike routes. Bike lanes are also appropriate on streets with light, but relatively fast auto traffic (especially streets with wide auto lanes; the addition of bike lanes will narrow the auto lanes, potentially helping to encourage slower auto traffic. They should have the following characteristics:

- Minimum width of five feet (more is preferred up to eight feet; greater width could cause motorists to mistake the bike lane for an auto lane) in each direction, measured from the curb where no parking is allowed, with at least 3 feet from the edge of the gutter. Where parking is allowed, the delineated area

should be at least 12 feet wide and ideally 14 feet to accommodate parking (8 feet), opening car doors (3 feet), and the bike lane (minimum of 3 feet along an open car door). The 14 foot width is also the minimum needed to accommodate adult tricycles and bike trailers.

- Clearly painted stripe and markings delineating the bike lane.

Staff Comment: In many instances the City's streets are too narrow to install bike lanes which conform to these standards without eliminating either a lane of automobile traffic (perhaps creating a one-way street) or eliminating one or both lanes of parking (often bitterly opposed by residents or merchants). Should Berkeley adopt these standards when it will mean that many of our existing bike lanes may be eliminated and few could be added? A thorough discussion of this issue is important.

Bike Routes (Class 3)

Bike routes have signs but no stripes delineating bike lanes. They are used primarily on local and collector streets. They should have route signs along the street at intervals of approximately 500 feet, and whenever the route requires a change in direction. Bike routes are useful to guide bicyclists when bicyclists are presented with a series of parallel quiet streets, with only some being either through streets or streets with better crossings of cross streets with auto traffic. Bike route signs can be enhanced by supplemental signs indicating destinations served by the route.

Staff Comment: Staff suggests that the City of Berkeley develop design specifications for "Class 2-1/2." This would consist of special signage or striping on a Class 3 bikeway which would bring the anticipated presence of cyclists more strongly to the attention of motorists. Class 2-1/2 would be appropriate on routes where bike lanes were desirable but where the road width was too narrow to conform to desirable standards.

In choosing shared traffic street as signed bike routes, one and preferably more of following criteria should apply:

- The route provides for direct travel in a high-demand corridor.
- The route connects discontinuous segments of bike lanes.
- Stop signs and signals are adjusted to give greater priority to bicyclists compared to alternative streets.
- Parking is eliminated or restricted in areas of critical width.
- Surface imperfections or irregularities have been corrected.
- Maintenance is performed at a higher standards than on comparable streets.

Bike Boulevards

Although it is not one of the three standard bikeway design types (paths, lanes, or routes), the "bike boulevard" is emerging as a special type of bike route. In cities that designate them, bike boulevards are streets with low automobile volumes that are altered to give precedence to bicycles. For example, two-way stops along bike boulevards can control traffic on cross streets, allowing non-stop travel for bikes along the bike boulevard. Bike boulevards often have traffic barriers to serve as filters every few blocks that prohibit or discourage cars from using them as a direct route, but which allow bikes to freely pass. Speed humps are also an appropriate means of discouraging through auto traffic on bike boulevards. An example of a bike boulevard is Bryant Street in Palo Alto.

RELATED STANDARDS

Bikeway Signing

All bikeways should have route signs along the way at intervals of approximately 500 feet, and whenever the route requires a change in direction.

Traffic Signals

Where bikeways cross major streets, the intersections should be signalized. At all locations with traffic actuated

signals bicycle sensitive loops should be installed so as to ensure that bicyclists will trigger the signal, and the area of the loop should be marked on the pavement so it is easily visible to the cyclist.

Stop Signs

Bike lanes and routes should have as few Stop signs as possible; in general Stop signs should be placed on bikeways only for compelling safety reasons. Four-way stops may also be required where bikeways cross more major streets.

Staff Comment: Most four-way stops in the City have been installed at the request of neighborhood residents who are concerned about automobile speeding. Many residents have little faith in other techniques to reduce speed. Changing the existing pattern of stop signs would require extensive education and negotiation.

Caution Signs

Where Class 1 Bike Paths cross streets, cautionary signs should be installed on the cross street to inform motorists that bicycles may be crossing; this is less important when the crossing is at a 4-way Stop or signalized intersection. The California Department of Transportation's (Caltrans) W79 symbol and W79A "Bike Xing" sign can be used for this purpose. Such signage is also appropriate on cross streets where bicycle traffic emerges from paths, lanes, routes, or boulevards, or from barriers, filters or diverters. In some cases such signing may be helpful even though the intersection is controlled.

Directional Guide Signs

Where bikeways intersect or terminate into other crossing bikeways, signs should direct bicyclists on the continuation of the route.

Paving

Paving on all bikeways should be maintained to be even and smooth. The City should follow appropriate standards for paving, repaving and repairing designated bikeways, to ensure that bikeways are as smooth as possible. Repaving and maintenance of designated bikeways should be given a high priority within the City's Pavement Management System. When a pavement defect affecting bike travel is discovered, it should be repaired as soon as possible; if immediate repair is not feasible, the defect should be marked (e.g., with orange paint) so that bicyclists can avoid the hazard.

Lighting

Good lighting increases bicyclist safety at night, and should be provided on all bikeways. For bike lanes and bike routes this entails ensuring that street lighting extend to the edge of the pavement. For Bike Paths, lighting should be provided the same as that deemed necessary for safety on pedestrian facilities in the area.

Sweeping

All bikeways should be swept by the City on a regular basis to keep them clean and free of debris. Designated bikeways should be given a high priority for sweeping by the City.

Tree Trimming

Trees along bikeways should be trimmed regularly to keep leaves and branches out of bicyclists' paths and to keep traffic signs visible.

Speed Hump Design and Maintenance

To reduce bicyclist discomfort, speed humps should have the minimum degree of slope necessary to compel auto speeds of 15 miles per hour. Careful construction is needed to ensure that the edges of humps are smooth and do not break off.

BICYCLE PARKING

Private

All new commercial construction and renovations of more than 2,000 square feet should be required to provide adequate bicycle parking at a rate of one bicycle space per 2,000 square feet of construction. This standard for bike parking should be considered a minimum; higher numbers will be appropriate for certain types of projects. Appropriate bicycle visitor parking in terms of quantity and security should be provided for all uses. The City should also prescribe bike parking requirements for additional situations, such as multi-family construction in residential zones. It should also explore incentives for incorporating bike parking within existing development.

Staff Comment: The City's current zoning code requires the installation of 1 bicycle parking space for each 2000 square feet of new construction in commercial districts. Unfortunately, because Berkeley is a built-out City there are relatively few opportunities to substantially bicycle increase parking in this way. When older buildings are reused it is often difficult to physically include bicycle parking. Staff suggests the establishment of a fund which would use in-lieu fees to provide and maintain bicycle parking in the public right-of-way.

Public

The City should ensure the provision of adequate public bicycle parking at important public facilities, including the Civic Center, Amtrak and BART stations, parks, libraries, schools and other locations with high bicycle parking demand.

ANCILLARY FACILITIES

Showers and Lockers

All new office construction and renovations over 10,000 square feet and retail construction and renovations over 20,000 square feet should be required to provide showers and lockers for employees, so that bicyclists can change into work clothes at their destinations.

Staff Comment: Development costs in Berkeley are already among the highest in the East Bay. Such a requirement would drive costs even higher in comparison to neighboring cities that do not have this requirement. The benefits of this proposal need to be weighed against its costs and its potential harmful effects.

Support Facilities

The City should explore provision of support facilities for bicyclists that include tire air, oil, and repair tools at the Civic Center, local libraries and other public facilities.

Bicycles on Transit

The City should support efforts by Amtrak, AC Transit, BART and other transit agencies to accommodate bicycles on public transportation vehicles.

BIKEWAY MAP

The City should create a map of all bikeways and bicycle parking facilities in Berkeley, which should be kept up to date as improvements are made.

A master "bike planning map" should be created for the City. This should show all major destination centers including public schools. Data should be acquired and reported to enable bicyclists and City policymakers to make informed street design decisions. Keyed to the map showing every current and proposed bikeway (Class 1, 2, 3) and III) should be the following data: Curb to curb street width, current bike lane widths, stop sign locations, traffic signal locations and bike detection loop locations, diverters and semi-diverter locations.

Staff comment: The City is investigating acquiring a GIS system which might fulfill this function.

The map should be reproduced in a high quality format and made available to the public free of charge through City offices, schools, transportation management programs, community organizations, bike shops and bike clubs. This could be supplement the mapping efforts of the Berkeley and East Bay Bicycle Coalitions. The map might also include numbered routes, which could be posted on route signs throughout the City to allow for easier navigation from place to place. San Francisco and Santa Monica are currently considering such systems.

PUBLIC AWARENESS PROGRAM

The City should develop and institute a public awareness program to encourage and facilitate bicycling. The program could include public service announcements on television and radio, mailings, advertisements, and other media to tell people about new bicycle facilities, to promote safety, and to encourage bicycling.

FEEDBACK PROGRAM

The City should have a system to receive feedback from bicyclists regarding bicycle facilities and needed improvements in Berkeley. Pre-addressed cards and a FAX number could be made available at City offices, schools, transportation management programs, community organizations, bike shops and bike clubs that would allow people to mail in ideas as to where improvements could be made or maintenance is necessary.

IMPLEMENTATION

BIKEWAY IMPROVEMENTS

Staff Comment: Staff has begun a detailed critique of this long list of improvements and changes, but the comments of individual bicyclists are vital in helping us decide which of these improvements should be installed, which should be eliminated from consideration, and what priority order they should have. Please take the opportunity on your regular routes to review the proposal and give us your comments. In future versions of the plan, the list will be sorted by geographical area to make it easier to use.

The following changes to the bikeway system should be considered for inclusion in the City Bikeways Plan. Major improvements are indicated on Maps in the Appendices. Some of the improvements discussed below are conceptual in nature, or could be implemented in alternative ways or along alternative alignments. Although it is not practical to reflect all variations in the figure, users of this document are encouraged to consider all alternatives.

Moreover, although the following recommendations were conceived with the idea of enhancing the citywide bikeway system, the list should not be considered exhaustive - particularly in regard to minor improvements such as Stop sign installation, adjustment, and removal. Other needs for bicycle improvements will undoubtedly come to light in the years ahead. What follows is a list of potential improvements that the consultants and members of the study advisory team believe warrant consideration for implementation in the near future.

A. Bike Paths (Class 1)

In addition to maintaining existing facilities, Class 1 bike paths are proposed for the following locations:

1. If it is abandoned, the railroad right-of-way that extends from Ninth Street between Murray Street and Anthony Street should be paved as a bike path. This will allow for a direct connection from Ninth Street to Murray Street and Emeryville, and it will allow cyclists to avoid the dangerous intersection of Seventh Street and Ashby Avenue. The City is already working with Caltrans to determine the feasibility of signalizing Ashby/Ninth Street, and this signalization should take into account the proposed bikeway. The Ninth Street bike path extension would facilitate a regional link through the City of Emeryville. The City of Emeryville's concept is to continue this bike path south along the railroad right-of-way to Doyle Street at Ocean Avenue where bike lanes would continue south on Doyle Street, eventually linking to a network of bike paths, lanes and routes through the rest of Emeryville. Doyle Street is a quiet street with a lot of parking but low through traffic volumes. Doyle Street would make a superior alternative bicycle route through Emeryville compared to Hollis Street, which has higher traffic volumes. This improvement would require coordination with the City of Emeryville, and would provide excellent connections from West Berkeley to both the City of Emeryville and beyond to the City of Oakland.
2. West Frontage Road from Gilman Street to the Emeryville city limit should be paralleled by a Class 1 bikeway. (This project is included in the I-80 widening plans developed by Caltrans.)
3. Old Western Pacific (Santa Fe) Right-of-Way. (This improvement has a low priority, since most community members feel that it would be redundant with the existing bikeway on California Street. This project would also require right-of-way acquisition and might present problems at crossings of streets.)
4. A southbound-only path through the southeast corner of People's Park, connecting the off-set intersections of Bowditch/Dwight with Hillegass/Dwight and avoiding the route continuity problems posed by the one-way eastbound segment of Dwight Way. The path would begin about a half-block north of Dwight, and a two-way pedestrian path could be built parallel to the new southbound bike path; the pedestrian path should be paved in a different color and should terminate at the current striped crosswalk on the west side of the Hillegass/Dwight intersection. The parallel paths would reduce conflicts between bikes and pedestrians. Since the westerly sidewalk on the south half of the Bowditch block approaching Dwight would be made redundant, it could be removed and landscaped to compensate for the loss of some Park greenery due to path construction. Lighting along this pathway will be very important.

As an alternative, Dwight Way could be made two-way east of Telegraph Avenue, which would allow for two-way bicycle circulation from Bowditch to Hillegass. Another alternative would be to erect signs directing cyclists to use Benvenue for southbound traffic. Yet another alternative would be to have a short counterflow lane. Traffic signal or Stop sign control on Dwight at Bowditch/Hillegass would enhance bicyclists crossing of Dwight under any of the alternative treatments.

The City should consider Stop signs on Dwight at Hillegass/Bowditch or possibly traffic signals. At minimum, bike crossing signs should be installed.

5. The Bike Paths encircling the lake and freeway overcrossing described in the 1990 Aquatic Park Master Plan.

B. Bike Paths Requiring Further Evaluation

1. Along San Pablo between Russell and Heinz. There should be a bike path instead of lanes so bikes can all cross San Pablo at one location without having to ride on the arterial, making the route clearer and safer. Parking would need to be removed on either the east or west side of San Pablo regardless of whether a path

or a bike lane were provided. This project needs to be evaluated in terms of effect on businesses and the relationship with pedestrians.

2. Bancroft Way from Oxford Street to Piedmont Avenue. This would require eliminating one lane of traffic to allow for a separated lane on the north side of Bancroft along the edge of the University campus. A two-way bike path may create too many conflicts with other types of traffic. It would need to be separated by a substantial physical barrier from parallel auto traffic.

An alternative would be to convert Bancroft and Durant, and possibly other south campus streets to two-way travel. This would require a major restructuring of the South Campus circulation system, and would mandate greater emphasis on non-auto circulation, since there would be a reduction in street capacity and parking for automobiles along the converted streets. Proposals to limit auto traffic on Telegraph Avenue north of Dwight make it timely for both the City and UC-Berkeley to examine new alternatives for South Campus circulation.

Staff Comment: This proposal and a few others in this plan, which would significant alter circulation patterns, should be reserved for thorough discussion during the General Plan revision process this summer. At this stage, narrowing the proposals to a few scenarios which would be best from the cyclist perspective would be useful.

3. A connection through Ohlone Park from Hearst Avenue to the BART station at Sacramento Street. (This improvement should be coordinated with provision of bikeway improvements in the Hearst Avenue-Ohlone Park Corridor to the east). It should include a pedestrian-bicycle path traversing the North Berkeley BART station and connecting with the Ohlone Greenway that extends north under the BART tracks through Albany. The design of the path would also require Stop signs at Gilman/Curtis where the Ohlone Greenway crosses it (this is an extremely difficult crossing). Paving and ramps/curb cuts are needed for a short distance north of Gilman, since only the pedestrian path is paved and has ramps here. Either Stop signs or humps are needed on Cedar, Rose, Hopkins and Santa Fe where the path crosses (High speeds rather than traffic volumes are of primary concern). A short stretch of unpaved path north of Gilman also needs to be paved. A curb cut is needed on south side of Cedar at Cedar-Rose Park.

4. Along the Oxford edge of the U.C. Berkeley campus (Some or all of this path may be needed to be provided on campus or see #5, below).

C. Bike Lanes (Class II)

In addition to existing facilities, Class II bike lanes should be demarcated on the following streets:

1. Marina Boulevard, Spinnaker Way and University Avenue within the Berkeley Marina. The Class II bike lanes should tie in with the Class I bike paths that already exist in parts.

2. Hearst Avenue from Shattuck Avenue to Oxford Street. Ultimately, Hearst Avenue's bike lanes should extend east to Gayley Road, unless a through route for bicycles can be established.

3. Fifth Street from Cedar Street to Hearst Avenue.

4. Along San Pablo Avenue as a connector from Heinz Street to Russell Street, if it is infeasible to make this a bike path - see item #5 above.

5. Oxford/Fulton Street from Hearst Avenue to Dwight Way. (This will require realigning traffic on Fulton

Street between Durant Avenue and Dwight Way to run in two directions, and might require elimination of parking on the entire segment.)

6. Dana Street from Bancroft Way to Dwight Way. One bike lane already exists on this one-way street, a second one should be installed and the street made two-way. If this happens, consideration should be made to also making Ellsworth north of Dwight two-way. Filters or semi-diverters and speed bumps also could be added on Dana.

Alternatively, if Dana remains a one-way street, the bike lane should be relocated from the east side to the west side of Dana. A contra-flow lane could be considered.

7. Adeline Street from Shattuck Avenue to Woolsey Street.

The following four proposals for bike lanes merit further study; each has special implementation problems, e.g right-of-way limitations:

8. Arlington Avenue from Marin Circle to the Berkeley city limit. This would ideally be extended northward into Contra Costa County.

9. Derby from Warring Street to Belrose Avenue; a short bikeway on Tanglewood Drive could connect this section to the Claremont Hotel and adjacent shops.

10. Rose from Hopkins to Spruce (Rose serves two public schools, Cedar-Rose Park, and the North Shattuck shopping district).

11. Hopkins in the vicinity of California/Monterey.

D. Bike Routes (Class III)

In addition to existing facilities, Class III bike routes should be demarcated on the following streets:

1. Marin Avenue from Monterey Street to the Albany city limit. This should be coordinated with the City of Albany.

2. Wildcat Canyon Road from Grizzly Peak Boulevard to the Berkeley city limit.

3. Grizzly Peak Boulevard, between the northerly and southerly city limit lines.

4. Shasta Road between Grizzly Peak Boulevard and the city limit (Tilden Park).

5. Centennial Drive from Stadium Rim Way to the city limit. This is mainly a UC Berkeley facility.

6. Stadium Rim Way from Gayley Road to Prospect Street, with a continuation on Prospect Street to Channing Way. This is mainly a UC Berkeley facility.

7. Piedmont Avenue/Gayley Road from Hearst Avenue to Dwight Way. The present barrier at Dwight Way that prevents auto traffic from proceeding south on Piedmont will require modification to permit bikes to easily pass.

8. Walnut Street and Shattuck Avenue from Eunice Street to Los Angeles Avenue.

9. Spruce Street from Vine Street to Grizzly Peak Boulevard.
10. Los Angeles Avenue from Marin Circle to Spruce Street, along Spruce to Keith Avenue, then up Keith to either Euclid or Bret Harte Road, up to Cragmont Avenue, then following Cragmont to Shasta, then up Shasta Road to Grizzly Peak Boulevard. (Part of this route may already exist)
11. Arlington Avenue from Marin Circle to the Berkeley city limit if bike lanes are deemed infeasible for this segment.
12. Colusa Avenue from Solano Avenue to the Berkeley city limit.
13. Colusa Avenue from Monterey Street to Sonoma Avenue, continuing on Sonoma to Josephine Street and on Josephine to Rose Street.
14. Sutter Street and Del Norte Street from Hopkins Street to Marin Circle.
15. Berkeley Way from Oxford Street to California Street. This may be made superfluous if major improvements are made in the Hearst-Ohlone corridor, or if Addison Street is developed as a Bike Boulevard, but at present, Berkeley Way provides a relatively low-traffic and safe route to the northern edge of the commercial core and to the western edge of campus. The unsignalized intersections at Martin Luther King, Jr. Boulevard and Shattuck are a problem.
16. Gilman Street from Hopkins Street to the West Frontage Road.
17. Rose Street from California Street to Cedar-Rose Park.
18. Allston Way from Oxford Street to Fourth Street. Ultimately, it is desirable to change the Oxford to Martin Luther King, Jr. Boulevard segment to bike lanes or a bike boulevard. See the discussion under "Bicycle Boulevards" below.
19. Addison Street from Fourth Street to Aquatic Park.
20. Fifth Street from Gilman Street to Cedar Street.
21. Hearst Avenue from Fifth to Fourth Street, and Fourth Street from Hearst Avenue to Dwight Way (Miles Cutter Labs).
22. Delaware Street from Ninth Street to Fifth Street.
23. Derby Street from Milvia Street to Ellsworth Street, and from Regent Street to Warring, with a connection via Tanglewood Street to Claremont Avenue. (Derby from Warring to Belrose should be a bike lane). Extending the bike route on Derby west to San Pablo with a further westward connection to Carleton should also be considered, though the crossings of Martin Luther King Jr. Way, Sacramento and the (particularly) the off-set connection across San Pablo Avenue to Carleton will require careful design and potentially new controls on traffic.
24. Fulton Street from Dwight Way to Prince Street, with a continuation on Prince Street and Deakin Street to the Oakland city limit.
25. Piedmont Avenue from Dwight Way to Russell Street.
26. The Uplands, Plaza Drive and Domingo Avenue from Claremont Avenue to Tunnel Road.

27. Tunnel Road from the Oakland city limit to Domingo Street, with an extension on Domingo Street to Russell Street.

28. Heinz Street from Ninth Street to San Pablo Avenue.

29. Ninth Street between Dwight Avenue and the new Class I bikeway at Anthony Street. Alternatively, remove parking between Dwight and Heinz and make this a Class II bike way all across West Berkeley. Another possibility is to make this a Bicycle Boulevard. See discussion below.

30. A bike route could extend south on Ninth Street from the existing Ninth Street bike lanes, then on to Murray, Seventh, Folger and Hollis Streets to the Emeryville City limits. This would tie in with the City of Emeryville's concept for a bike route on Hollis to 67th Street where it would connect with existing bike lanes on Bay Street. Alternatively or additionally, the previously described proposed bike path extension of Ninth Street across Ashby could continue along the railroad ROW and through Emeryville.

31. Berryman Street to The Alameda, The Alameda to Capistrano Avenue, Capistrano to Colusa Avenue (this would provide a northern continuation of the Milvia bikeway, bypassing worst hills and Solano traffic).

32. Other extensions to provide connections to schools.

33. Virginia from Shattuck easterly to the Northside area. This should be considered in conjunction with the Hearst-Ohlone corridor plans.

E. Bike Boulevards

The following streets, which currently have Class 2 bike lanes or Class 3 bike routes, should be redefined as "bike boulevards," with restrictions on cross traffic and priority for bicyclists:

1. Milvia Street from Hopkins Street to Russell Street. Possibly a connection across Adeline-Shattuck at Oregon to Fulton for access south of Ashby could also be included. Milvia should be the major north-south route and alternatively, upgraded to Class II between University and Allston, in addition to other upgrades.

2. California Street from Hopkins Street to the Oakland city limit.

3. Ninth Street from the Albany city limit to Dwight Way. At the Albany border, either make the bike way go onto Harrison Street to Eighth St., which connects to Jackson St., passing through Albany Village, or re-establish the connection between Ninth St. and Jackson St. Extend further with extensions through both Emeryville and Albany (See A.1. above regarding the Emeryville extension).

4. Channing Way from Fulton Street to Aquatic Park. Channing Way is a good east-west route for bicyclists. It runs beside several large existing or planned student housing complexes. And it is a bike route that is already "in place" and in use. An alternative to a bike boulevard would be to paint either a dashed yellow line or, in some cases, a double solid yellow line between the opposing auto lanes at even midblock locations. This could improve safety along Channing's rather narrow roadway, and benefit cyclist by inducing motorists to drive straighter and perhaps slower. The double yellow line painted last year from Dana to Telegraph has reportedly had such a traffic calming effect.

This bikeway should provide a connection across the Southern Pacific Railroad right-of-way and connection to Aquatic Park. If a direct connection is not deemed desirable, then cyclists on Channing should be directed one street north to Bancroft at Fourth St. so they can use the existing railway crossing on Bancroft. It is best to have at most one at-grade crossing in the vicinity, since the Southern Pacific Railway right-of-way is being increasingly utilized for passenger rail service.

Staff Comment: The City has submitted a Transportation Development Act application for the signalization of the intersection of Channing/Martin Luther King, Jr. Way with a bicycle/pedestrian signal similar to those in use in Palo Alto on their bike boulevard.

- a. An alternative would be to consider a bike boulevard on Allston west of Milvia instead of Channing since there already are signals there. Allston is closer to University and therefore maybe a better parallel alternative to using University plus it would be a better tie in to Bancroft. Allston is narrow and has a fairly high level of auto traffic. This would either have parking removed one side and lanes striped, or have speed humps to slow down traffic. There must also be some provision for bicyclists to cross Oxford to enter and exit campus: crossing is particularly difficult because the bend in Oxford as it connects to Fulton Street makes it particularly difficult for cyclists to see southbound traffic.

Staff Comment: Center Street has the advantage of a signalized intersection at Oxford. It also leads to the principle cross campus route. Discussions are currently underway with U.C. to improve the connection from Center Street to the campus for bikes.

- b. Addison Street from Oxford Street to Aquatic Park. Addison is an even stronger candidate for Bike Boulevard development than Allston. Already Addison provides a comparatively low-traffic alternative route to University for traffic bound to and from the City's commercial core and to the western edge of campus (Center Street, one block south, provides direct access onto the campus). The unsignalized intersections at Martin Luther King, Jr. Boulevard and Shattuck are problematic; signals or other new traffic controls may be required.

6. Hearst Avenue Corridor, from Oxford Street to California Street; this would probably include a Class I path connection through Ohlone Park to the BART station at Sacramento Street. Traffic diverters, Stop signs and speed humps could be installed at strategic points on Hearst; the signalized intersections of Hearst/Milvia, Hearst/Shattuck and Hearst/Oxford should be modified to ease bicycle travel and enhance bicyclists' safety.

- a. An alternative treatment for encouraging bicycle access along Hearst would be to make Hearst Avenue a one-way street flowing west (i.e., downhill) the length of Ohlone Park, from Milvia Street to California Street. Eastbound bicycle traffic would be accommodated by a path system within the park. The path would be relatively safe for mixed use with pedestrians since bicyclists would be travelling uphill.

- b. Another suggestion is to improve access between West Berkeley and North campus via Bike Boulevard development of Virginia or Delaware from Eastshore Highway to Euclid.

Staff Comment: The Hearst Corridor is potentially one of the more important bike boulevards in the City--and also possibly one of the most difficult to develop. Ideally it should run all the way across the City from East to West. Several options were suggested during this process. All have both advantages and disadvantages. Staff recommends continued discussion, but with the added goal of access to the east side of campus.

F. Bikeways To Be Removed

Under this plan, the following bikeways would be removed from the existing City bikeways plan, since they would be redundant with other routes and/or too congested for safe cycling. No on-street markings or signing of these current bikeways should be removed until the specified alternative routes are in place.

1. Ensenada Avenue (Class III) between Marin and Peralta Avenues, which will be redundant with Colusa Avenue. Colusa Avenue is a through street, connecting to Kensington, and does not have traffic volumes that would preclude cyclists.
2. Center Street between Milvia Street and Martin Luther King Jr. Way. This short Class II bikeway shown in the current plan has no ultimate destination, and can be replaced as a much longer bikeway by Allston Way.

Staff Comment: See previous comment about the usefulness of Center Street as access to the U.C. Campus.

OTHER PROJECT IMPROVEMENTS

The following improvements to the bikeway system would be completed under the plan as amended by the changes to the citywide system presented in the preceding section.

G. Major Projects

1. An overpass to accommodate bicycles and provide access to the Berkeley Marina should be built near University Avenue over Interstate 80 and the railroad tracks. This project should be designed, funded and constructed by Caltrans. The City applied for a federal Transportation Enhancements Activities (TEA) grant to partly fund this overpass, but the proposal was rejected because of the cost of the project. Since then the projected costs have been reduced and the City is still seeking funding.
2. The bike path on the east side of Aquatic Park should be straightened and repaved to better accommodate cyclists. Drainage problems on this bike path should also be corrected. This improvement is included in the Aquatic Park Master Plan.
3. The intersection of Woolsey and Adeline should be studied to find a way to make a safe crossing for bicyclists.
4. The bike path in the BART right-of-way north of the North Berkeley BART station should be reconstructed to have a total width of ten feet (eight feet if ten is infeasible).

H. Minor Projects

1. Traffic barriers at the intersection of Dwight Way and Dana Street need minor adjustment to allow bikes to pass through more easily.
2. The "Right Turn Only" signs at the intersections of Channing Way and Martin Luther King Jr. Way, Bancroft/Oxford/Fulton, Oxford/Hearst, Hearst/Gayley, and Milvia/Allston should be modified to say "Except Bikes", so that bicyclists can legally proceed straight through this intersection.
3. The intersection of Dwight Way/California Street has been restriped on the north leg. However, a possibility to improve this intersection further may be to create a park or open space to narrow the north leg of California.
4. The intersection of Milvia Street/University Avenue should be restriped to allow for better through bicycle circulation.
5. Repave both sides of Ellsworth from Blake to Dwight.

I. Curb Cuts

To facilitate bicycling, curb cuts are needed at several locations, including the following:

1. BART bike path at Cedar Street.
2. Parker Street at Mathews Street (landscaped diagonal diverter).
3. Derby Street at Mabel Street (landscaped diagonal diverter).
4. Russell Street at Park Street (landscaped diagonal diverter).

J. Rail Crossings

Rubberized (or other bicycle-friendly) rail crossing surfaces should be installed at all railroad crossings but especially at the following locations:

1. Gilman Street near Third Street.
2. Addison Street near Third Street.
3. Bancroft Way near Third Street.
4. Channing Way near Third Street (if new crossing implemented).

K. Traffic Signals

The City is already in the process of installing bike-actuated loops at the 13 existing actuated signals in the City, which will make signals switch on the next cycle when a bicycle is present. As stated above, traffic signals should also be installed where bike lanes and routes cross arterials. In particular, the following intersections should be studied for signalization or changes to the existing traffic signals in the near future:

1. Ashby at Ninth (This signal is already under study by the City and Caltrans, and should include consideration of the bikeway to be built in the railroad right-of-way.)

2. San Pablo at Russell or Heinz. (If possible, this dog-legged intersection should be controlled with a single signal.) The intersection does not meet current Caltrans warrants, and San Pablo is a State Highway, requiring Caltrans agreement for any changes in traffic control.
3. Ashby at Hillegass. (This signal would require the cooperation of Caltrans since Ashby is a State highway; the intersection is unlikely to meet traditional signal warrants). The City is reviewing the Ashby/Benvenue intersection because of accident problems. The "solution" for Ashby/Benvenue will consider Hillegass as well.
4. Ashby at Fulton. This signal already exists but without bike traffic control. It is actually already scheduled for improvement under the City's Bike Loop project.
5. Telegraph at Russell.
6. Dwight at Fulton. This signal exists, but needs to be redesigned to provide a signal face for bicycle traffic in both directions on Fulton Street.
7. Ellsworth/Dwight. This signal exists, but needs bike actuation on the southern (north-bound) leg. The signal was installed for school crossing reasons and any changes need to be coordinated with the school's needs. If Ellsworth north of Dwight becomes two-way, further signal modification will be needed.
8. Dwight at Ninth.
9. Move traffic signal from Ward/Sacramento one block north to Derby/Sacramento but coordinate with school crossing needs.
10. Dwight at California.
11. Ashby at California (This signal would require the cooperation of Caltrans since Ashby is a State highway; the intersection is unlikely to meet traditional signal warrants).
12. Oxford at Allston.
13. Shattuck at Russell.
14. Bancroft at Dana (if Dana is changed from one-way southbound).
15. Dwight at Hillegass/Bowditch
16. Gilman at Curtis (BART right-of-way bike path) and/or Santa Fe
17. Hopkins at the BART bikeway.
18. Rose at the BART bikeway.
19. Cedar at the BART bikeway.
20. Channing at Martin Luther King, Jr.
21. Channing at San Pablo (coordinate with Caltrans since San Pablo is a State Highway).
22. Martin Luther King, Jr. at Center Street or at Addison if an Addison Street bikeway is considered.

23. Addison's upper junction point with San Pablo (coordinate with Caltrans since San Pablo is a State Highway).
24. Addison at Sacramento.
25. Berkeley Way at Shattuck.
26. Bancroft at Bowditch
27. Signalized intersections along Milvia and other proposed Bike Boulevards should be reviewed and refined to enhance safe bicycle movement through them.

L. Signal Modification

The following signal modifications would be required to permit two-way bicycling and/or motor traffic on portions of Dana, Fulton, Bancroft and Durant. These are all presently one-way streets:

1. Existing signals at intersections of Dana with Dwight, Haste and Durant need to be modified.
2. Existing signals at Fulton's intersections with Haste and Durant need to be modified.
3. Existing signals at Bancroft's intersections with Telegraph, Fulton, and Shattuck, and with the mid-block crosswalk near UC's Eshleman Hall need to be modified.
4. Existing signals at intersections of Durant with College Avenue, Bowditch, Telegraph, Dana, Ellsworth, Fulton, and Shattuck need to be modified.

In general, signals are preferred where bikeways cross major streets (arterials). Stop signs for opposing traffic are preferred where bikeways cross collector streets.

Staff Comment: As most readers will know, signals are costly. The thirty signals listed above represent an investment of between \$1.5 and \$3 million. The need for the signals would need to be verified and the installations would need to be prioritized and spread out over a period of many years. Sometimes cheaper alternatives may exist, for example setting the timing on signals on nearby intersections to create a gap in the traffic for those on the bikeway.

M. Stop Signs-- Removal/Redeployment

Two-way stop signs should be installed where necessary on streets that intersect bikeways, and bikeways should have through traffic movements wherever possible. In many instances this means reversing 2-way stops along bikeways and placing them on cross street. In particular, the following stop sign locations should be studied as soon as possible for potential removal/redeployment of Stop signs:

1. Along California Street, which currently has many two-way stop signs impeding through bike traffic.
2. Along Milvia Street between Russell and Hopkins.
3. Along Walnut Street between Hearst and Eunice.
4. Along Spruce Street at Cedar, Rose and Virginia.

5. Along Ninth Street throughout the City.

6. Along Hillegass south of Dwight.

N. Stop Signs--Potential New Locations

The following locations should be studied as soon as possible for potential new installations of Stop signs:

1. Install Stops on Cedar at Ninth.
2. Install a four-way Stop at Hopkins at Monterey/California.
3. Install a four-way Stop at Hearst at California.
4. Install Stops on Bancroft at the intersections with Dana and Bowditch.
5. Install Stops on cross-streets intersecting with Channing, such as Browning and Acton. Correspondingly remove Stops on Channing at these locations.
6. Install Stops on the east side of Webster Street, and possibly on the west side too, where it intersects with Hillegass. Correspondingly remove Stops on Hillegass at Webster. Also remove Stops on Hillegass at Parker.
7. Install Stops on the north side of Woolsey at Hillegass (there is a diagonal diverter here).
8. Install Stops on both sides of Blake Street where it intersects with Fulton (there is a diagonal diverter here).
9. Install Stops on Gilman at Curtis, as a temporary solution prior to signalization.
10. Possibly install Stops on Santa Fe where the bike path crosses it.
11. Install Stops on Hopkins at or near Peralta.

There are many other potential locations. Again, the guiding principle should be to avoid stop signs facing bikeways except when warranted by traffic safety consideration.

O. Cautionary Signs

Where bike paths cross streets, caution signs may be installed if the cross street traffic is required to stop, to alert motorists that bicycles may be crossing. Other locations may also be suitable for caution signs. Where appropriate caution or Yield signs should also be installed to direct bicyclists. For example, a proposed bike path through People's Park should have signs advising bicyclists to be careful as they cross the sidewalk and reenter the roadway. In particular, caution signs should be installed at the following locations:

1. Cedar Street at the BART bike path. This now has a "Ped Crossing" sign
2. Rose Street at the BART bike path.
3. Hopkins/Peralta Street at the BART bike path.
4. Gilman Street at the BART bike path.

5. Dwight near Hillegass (with or without a bike path through the park)
6. Both Bowditch and Haste near their intersection (if the bike path is built through the park)
7. Bancroft near Dana and near Bowditch (especially if Stop signs or filters are not installed)
8. Ashby near California and near Hillegass (unless traffic signals are installed)
9. Martin Luther King, Jr. Way near Channing (unless traffic signals are installed)
10. Oxford near Allston (if Allston becomes a bike route and the intersection remains unsignalized).
11. Dwight near Piedmont.
12. Martin Luther King, Jr. Way near Hearst.
13. Hearst near Spruce.
14. Shattuck and Adeline near Derby (if Derby becomes a bike route)
15. On each converging street near Marin Circle.
16. Near certain intersections that have a diagonal diverter (see discussion below)
17. Filter/Diverter Treatments.

Where bicyclists are to ride through traffic barriers, signs must clarify the legality of doing so. The safety of going through must be improved: The barrier gaps must be wide enough for a cyclist to pass through safely, but narrow enough to prevent a car from doing it. Motorists must expect bicyclists to appear and disappear through the barriers. The city is currently developing prototype design treatments for barrier controlled intersections as part of this plan process.

P. Intersection Design

At intersections heavily used by both cyclists and motorists, design should reflect a goal of getting cyclists in front of motorists so they can be seen. Clearly visible warning signs at and in advance -- e.g. "Bike Xing" signs, distinct pavement marking setting off space for bikes to wait at intersections. The city is currently developing prototypes of such design treatments as part of this plan process.

Q. Bikeway Striping and Signing

All bike lanes and routes described in Part I (above) should be signed, and (in the case of bike lanes) striped. For capital planning purposes, this would be considered a single project, with an approximate cost of \$400 per block.

R. Signal Timing

Signal clearance phase along bikeways should assure bicycles have enough time to get across.

S. Directional Signs

Where bikeways terminate into other crossing bikeways, signs should direct bicyclists on the continuation of the route. In particular, the following directional signs should be installed:

1. At Gilman Street where it intersects with the bike path in the BART right-of-way.
2. At Spruce and Rose Streets.
3. From Hopkins Street to Sutter Street to Del Norte Street, and vice-versa.
4. From Berkeley Way to California Street to Delaware Street, and vice-versa.
5. From Deakin Street to Prince Street to Fulton Street, and vice-versa.
6. From Russell Street to San Pablo Avenue to Heinz Avenue, and vice-versa.
7. From Addison Street, Allston Way, Bancroft Way and Channing Way onto Ninth Street, and vice-versa.
8. From Ninth Street along Murray Street, Seventh Street and Folger Avenue to Hollis Street, and vice-versa (contingent on construction of this connection).
9. Milvia at Oregon and Russell. Milvia at Berryman.
10. From Bowditch to Bancroft to bikeways inside the central UC campus.
11. From Allston to Milvia to Center and to Bancroft, and vice-versa (if Allston becomes a bike route).

Directional signs should also be used to indicate final route destinations or destinations of interest along the way.

T. Lighting

Good street lighting increases bicyclist safety at night (as do lights on the cyclist and bicycle, too!). The following locations should be studied with regard to installation of improved lighting:

1. Aquatic Park bike path
2. Heinz Street.
3. A bike path through People's Park, if implemented.
4. Russell Street.
5. Hearst Avenue.
6. A bike path in the railroad right-of-way between Heinz and Murray Street, if implemented.
7. If implemented, the proposed path in the former Santa Fe right-of-way.

U. Bicycle Parking

The City should install adequate public bicycle parking at important public facilities, excluding the schools (Berkeley Unified School District is responsible for their facilities). As a first priority, additional parking should be installed at the following locations:

1. The Civic Center.
2. BART stations. (all stations)

3. Public parks.
4. The Central Library
5. The Sather Gate Garage
6. The Center Street Garage

Staff Comment: The City has received a Transportation Enhancement Activities grant to install nearly \$100,000 worth of bicycle parking city-wide. Staff is currently identifying the exact sites for installation.

V. Paving Improvements

As stated above, paving on all bikeways should be smooth and even. As a first priority, the following streets should be repaved:

1. Hearst Avenue along Ohlone Park. (Between Martin Luther King, Jr. Way and Sacramento) including cutting tree roots.
2. Hillegass Avenue.
3. Spruce Street.
4. Russell Street from San Pablo Avenue to California Street.
5. Walnut Street from Hearst Avenue to Eunice Street.
6. Monterey Avenue from Hopkins Street to Sonoma Avenue.
7. Channing Way from Milvia Street to Aquatic Park.
8. Entire length of Fulton.
9. Ellsworth from Blake to Dwight.
10. Virginia-Sacramento to Martin Luther King, Jr. Way.
11. Claremont-Oakland line to Uplands.

W. Paving Differentiation

In addition to being kept smooth for bicyclists, some pavements within bikeways or bike crossings should be designed so as to be readily visible for bicyclists while they are riding. Distinctive paving texture, color and/or at least striping would seem desirable for (at least) bike routes which cut through pedestrian space.

APPENDICES

APPENDIX A

APPENDIX B

Maps

Draft Diverter and

Intersection Design developed by TJKM.



City of Berkeley Diverter and Intersection Design

DiverTERS

The City of Berkeley has installed a large number of diverters (also called traffic barriers) to reduce the incursion of traffic into its neighborhoods. The term diverter may be more accurate, since when traffic is blocked from one street it does not usually evaporate but is instead diverted to another nearby street. These diverters are highly successful in reducing traffic volume near the installation point, and residents are often satisfied by the perceived reduction in traffic speed even when it is objectively small.

There are several good reasons to treat bicycle traffic differently from automobile traffic at diverters, by allowing bicycles to pass where automobiles cannot:

- Most residents do not consider bicycle traffic on their streets a safety hazard in the same way as automobiles.
- Many bicyclists prefer to ride on streets where automobile traffic is light, such as those with diverters.
- The City may want to actively promote bicycle travel.

In public workshops and through private communications, Berkeley bicyclists have identified two distinct problems with the diverters now in use:

- They do not always allow easy bicycle passage. (In the case of diverters constructed of guardrail they may not allow passage at all.) This is primarily a matter of diverter design.
- Because motorists look in directions where they expect to see other motorists, they fail to anticipate bicyclists who suddenly enter an intersection across or through a diverter. This is primarily a matter of diverter placement.

Diverter Design

Berkeley diverters consist of either a row of concrete bollards or a section of guardrail, or in a few cases a landscaped street closure. Many designs are possible, from simple asphalt berms to fully landscaped islands; they differ in cost, appearance, and ease of maintenance but not in basic functionality.

For safe bicycle passage, and to allow for trailers and adult tricycles, diverters should provide a clear width of at least 5 ft (Highway Design Manual, Topic 1003.1), although as little as 4 ft can be workable. The practical maximum is 5 ft 6 in, set by the width of an automobile. On a two-way street this clear width should be provided for each direction of bicycle travel; the

City of Berkeley Diverter and Intersection Design

placement of the opening is not usually critical as long as the placement guidelines below are followed.

Berkeley's concrete bollards seem to be irregularly spaced. Sometimes the space between them is wide enough for a bicycle, sometimes not, and it is not predictable. The bollards should be realigned to a standard spacing of $5\text{ ft} \pm 6\text{ in}$ edge to edge at the base (where they are widest).

A half-width diverter needs only one opening; a full-width diverter can provide either two separate 5-ft openings or a single 10-ft opening in the center divided by a concrete block or a 4-in diameter, 4-ft high locking barrier post. The single opening has the advantage that it allows passage of emergency vehicles. In some cases it may be necessary to prohibit parking near the barriers by means of signs or red curbs to preserve access to the openings.

The diverter itself should be liberally identified, as appropriate, with single white or yellow reflectors, diagonal reflector arrays, edge reflectors, and reflective tape or paint. The upper half of posts should be wrapped diagonally with parallel stripes of orange and white reflective tape for maximum visibility day and night, and a 2-by-10-ft envelope should be painted on the pavement around the post.

Plantings on landscaped diverters or closures should not obstruct sight lines or shed leaves, seeds, fruit, or nuts onto the roadway.

Diagonal diverters may be less objectionable to motorists than full diverters, because they redirect traffic rather than forcing it to stop, but they tend to be unsatisfactory to bicyclists, who (depending on the diverter geometry and bicyclist maneuver) may be exposed to cross traffic on both sides of the diverter. In this case the opening, in addition to being wide enough for passage, needs to be long enough to create a refuge: 6 ft for a bicycle, 10 ft for a bicycle plus trailer. This length can be created by a tapered island, a double row of bollards, or landscaping. It can often be oriented obliquely to the diverter, reducing space requirements; even so a 10-ft refuge may be impossible to attain.

The design requirements for short median barriers placed at intersections to restrict turning are similar to those for diagonal diverters.

Diverter Placement

The principle here is that on the far side of a diverter bicyclists should not immediately encounter cross traffic at intersections or driveways. This means that full diverters should be placed midblock rather than at intersections; midblock means that the diverter is at least 50 ft from any cross street or business driveway. (Fifty feet is a reasonable stopping distance, including reaction time, for a bicyclist traveling at 15 mi/h.) With some designs and at some locations, it may be necessary to prohibit on-street parking or to trim foliage to provide adequate sight lines.

Half diverters should not be placed at the exit to a street, but should be at least 50 ft from the next cross street or business driveway in the direction of travel. The preferred location for a half diverter is at a street entrance.

City of Berkeley Diverter and Intersection Design

Diagonal diverters and median barriers, which have no flexibility in location, should provide openings long enough to protect bicyclists who cannot proceed safely.

Diverter Types

Where the City wants to change existing diverter design or placement that is unsatisfactory to bicyclists, it has two options:

- Retain the existing pattern of street closures, either because it was once considered desirable or because any change would provoke opposition.
- Modify the pattern of street closures to employ a greater variety of traffic diversion techniques.

In some cases, for instance, the City might decide to replace a full diverter with two half diverters (or perhaps only one half diverter). Both full and half diverters can be acceptable to bicyclists if they are properly designed and placed, but half diverters have the advantage of greater flexibility in placement. Although half diverters are easily violated by motorists, the rate of violation should still be relatively low, and by the same token they offer easy passage to emergency vehicles. The security of half diverters can be improved by extending a concrete median beyond the diverter (provided that it does not block access to driveways or parking, and even this can be provided to some extent by openings), forcing drivers to travel on the wrong side of the road for prolonged distances in order to circumvent the barrier.

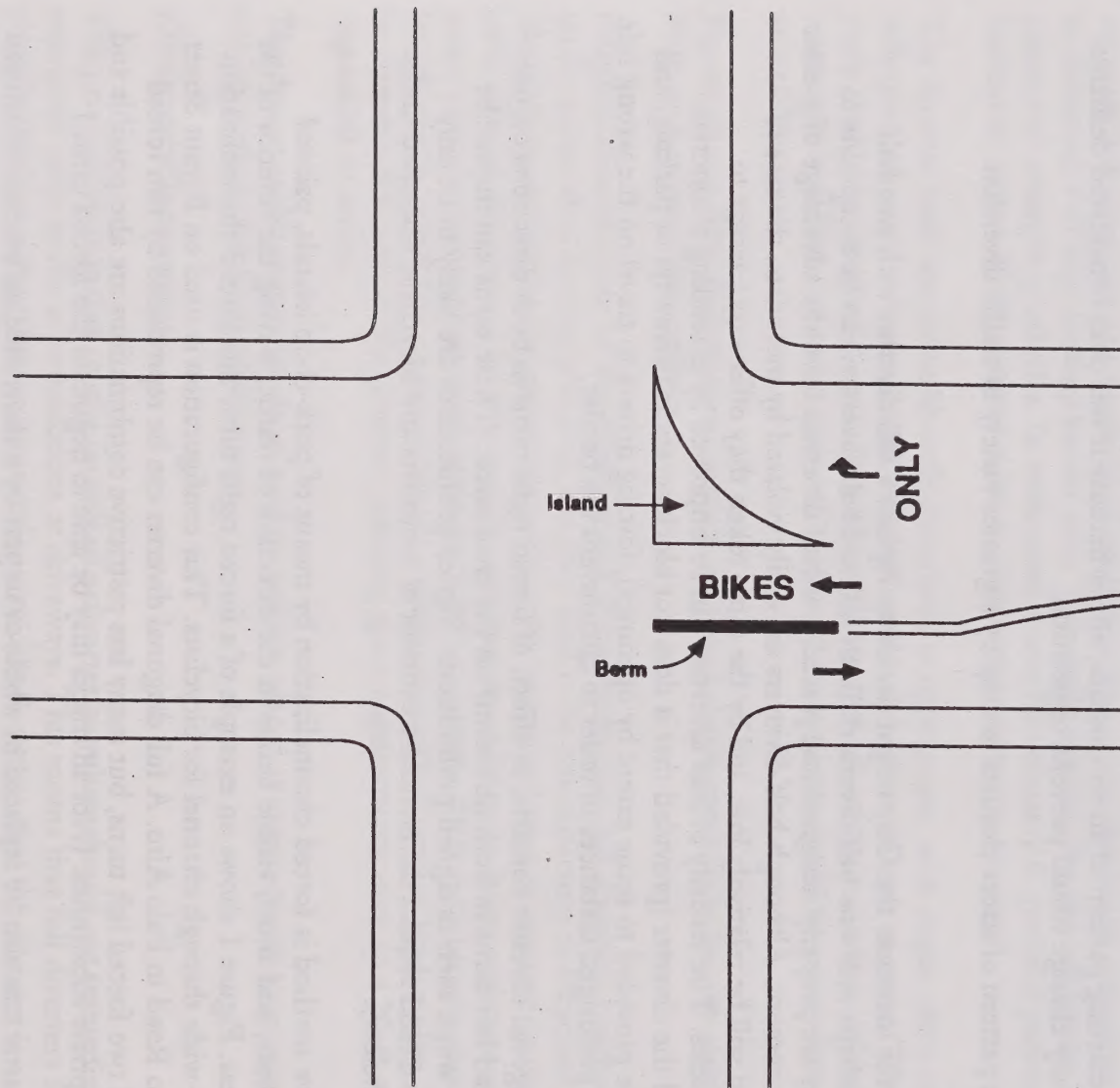
Similarly, a diagonal diverter consists, in effect, of forced right turns in both directions on one street, and forced left turns in both directions on the cross street. These turns can instead be forced in other ways, such as signed prohibitions. Signed prohibitions are likely to be only partially effective (and require differential treatment of motorists and bicyclists, discussed under "Legal Issues" below).

A more effective method is forced channelization by means of pork-chop islands, painted islands, traffic bars, and short, visible berms in the direction of traffic, leaving the interior of the intersection clear. Figure 1 shows an example of a forced right turn; this forced channelization includes a 5-ft-wide through channel for bicyclists. This configuration is used on Bryant Street at Embarcadero Road in Palo Alto. A full diagonal diverter can be reproduced by two forced right turns and two forced left turns, but many less restrictive combinations are also possible and could be appropriate substitutes. (Not all trucks may be able to negotiate the forced turns.)

A diagonal diverter can also be replaced in whole or in part by a short median barrier, which can permit various combinations of turns but prevents through travel. Both the diagonal diverter and the median barrier require a refuge for bicycles, as described under "Diverter Design."

One other type of traffic calming device is acceptable to bicyclists: speed humps 4 in or less high and 12 ft long or longer, such as those used on Milvia. Traffic circles should be used with care, since deviation from straight-line travel can interfere with lane-sharing.

B4



Not to Scale

City of Berkeley - Berkeley Bicycle Plans
Forced Channelization

Prepared By
TJKM

FIGURE
1

Legal Issues

The City's policies must clarify the legality of bicyclist passage through diverters. Some bicyclists have already been cited for riding through them, which does not seem to be the City's intent. There are two ways to permit bicyclists to pass through diverters while preventing motorists from doing so:

1. The barrier to passage is a purely physical one. There is no legal prohibition against crossing the diverter, but its design simply allows bicycles while interfering with motor vehicles—for instance, an opening wide enough for bicycles but too narrow for automobiles. With this approach, warning signs such as W3 (turn arrow), W57 (single head arrow), W53 (Not a Through Street), W81 (chevrons), and many others would be permissible, but regulatory signs such as R11 (Do Not Enter) would not. There is no practical way to exclude motorcycles, mopeds, or motorized bicycles.
2. A regulatory sign prohibits passage—for example, R11 (Do Not Enter) or R41 (Right Turn Only)—and violating it has legal consequences. In this case there must be an exception for bicycles. The City of Palo Alto sometimes installs an "Except Bicycles" plate on signs of this sort at barriers, but such a distinction is probably improper under state law. Vehicle Code §21101(f) (enacted in response to *Rumford v. Berkeley* (1982), declaring traffic barriers illegal) permits local authorities to prohibit entry to or exit from any street by means of islands, curbs, traffic barriers, or other roadway design features; control devices or markings placed on the barriers must conform to the uniform standards and specifications of §21400; local authorities are also permitted to regulate turning movements at intersections by placing signs or other traffic control devices, and it is unlawful for vehicular traffic to disobey these signs (§22101).

Under §21200, traffic laws that apply to drivers of vehicles generally apply also to operators of bicycles. Thus there seems to be no provision to permit bicyclists to pass where motorists are prohibited. Even so, a distinction might be workable in practice if the Berkeley Police Department agrees to it. The better course, however, would be to seek carefully drawn amendments to the relevant sections of the Vehicle Code.

Conceivably, a short section through the barrier could be designated as a bicycle path (if it were at least 5 ft wide for one-way travel, as required by Caltrans standards), legitimizing the distinction between bicycles and motor vehicles.

Intersection Design

Offset Intersections

Offset intersections are either offset left or offset right (such as Milvia at University). Offset right presents the greater problem, since the natural tendency of many cyclists to stay too far right is amplified by the offset, intensifying the conflict between through bicyclists and right-turning motorists. (Note that the problem is with right turn on green, not on red).

Conflict between through bicyclists and opposing left-turning traffic is also exacerbated by the offset, since left-turning motorists are less likely to see bicyclists near the curb. (Opposing automobile traffic may be to the turning motorist's right, and opposing bicycle traffic to the left.)

The right-turn conflict can be reduced by creating a right-turn-only lane with, if space permits, a through bicycle lane to its left. The left-turn conflict can be reduced by splitting the opposing signal phases, or by adding a left-turn phase if the controller and available traffic lanes permit. These solutions are not entirely independent: the right-turn-only-lane moves bicyclists nearer to the center and makes them more visible to oncoming traffic; the split signal makes bicyclists feel more comfortable staying farther to the left. It may also be helpful to prohibit right turns on red on the cross street, to allow bicyclists to reach the far curb without interference.

The suggested lane assignments may result in two or even three lanes outbound and only one inbound, thus offsetting the centerline even farther. This should not be a problem if the signal phase is split or there are separate left-turn indications.

An offset-left intersection has less right-turn conflict but more left-turn conflict (because the clearance is less). The same measures should be useful at these intersections. In this case the asymmetric centerline also tends to reduce the offset.

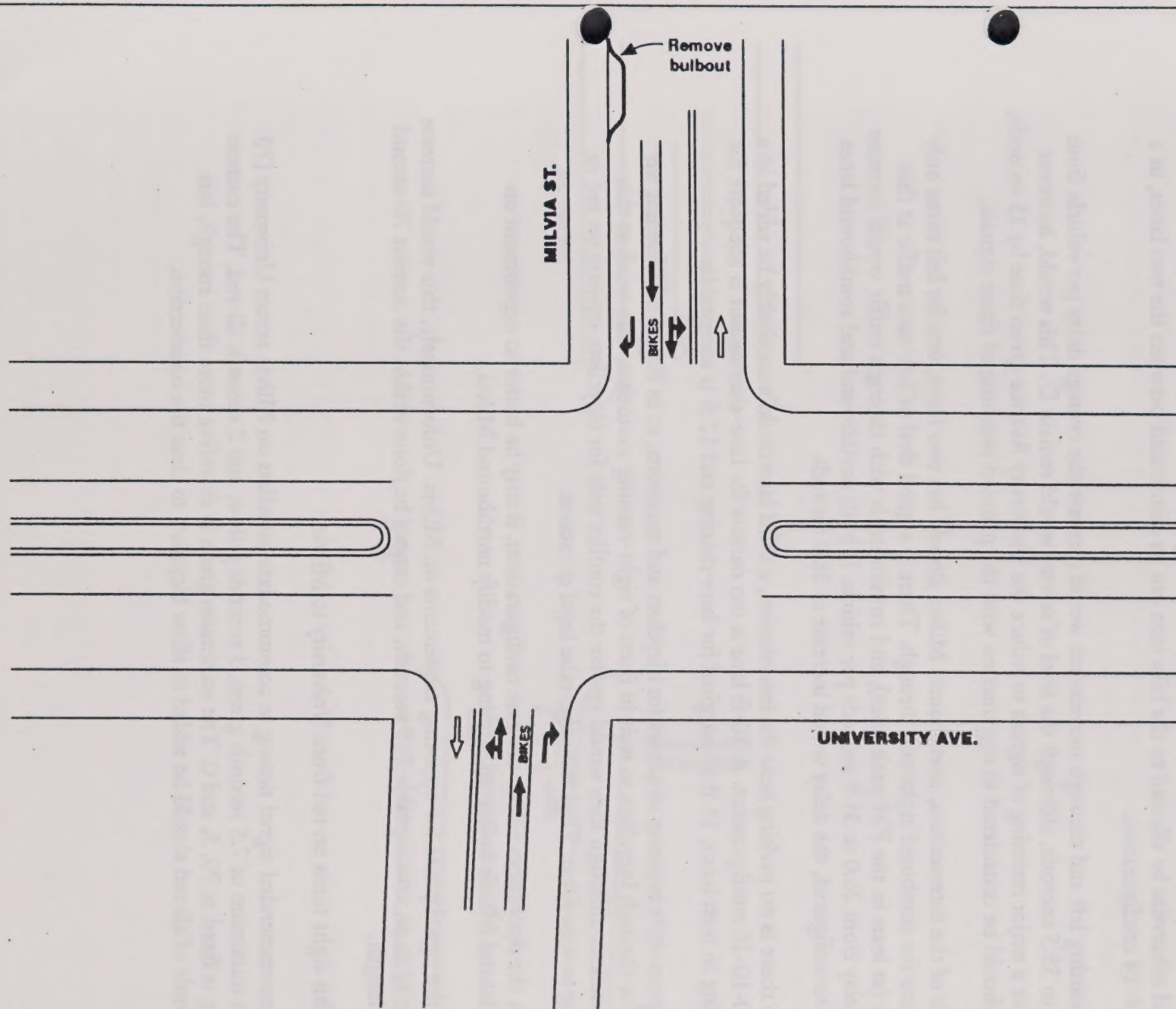
On Milvia at University this leads to the following recommendations:

1. Southbound Milvia before the intersection now has only a single wide lane; the centerline is angled slightly toward the west. Divide this lane into a right-turn-only lane from southbound Milvia to westbound University—even though the number of turning movements would not normally justify this lane—and a wider lane for left and through movements. There is ample room on the roadway to do this (see Figure 2).

To provide access to the right-turn lane, it may be helpful to remove the bulbout north of University and to straighten out the centerline. This should be done only if a trial period indicates that it is necessary.

There is even room to put a segment of through bike lane between the two southbound lanes. Disconnected segments of bike lane are usually not useful, but in some locations, such as this one, they can serve a useful purpose by indicating proper lane position near an intersection, merge, or diverge. Milvia is 40 ft wide at University; the suggested lane widths are 12/12-4-12, where 4 represents the through bike lane.

t.2



Not to Scale

City of Berkeley - Berkeley Bicycle Plans
University - Milvia

Prepared By
TJKM

FIGURE
2

City of Berkeley Diverter and Intersection Design

From the bicyclist's point of view, 12 ft, or even less, is entirely adequate for an exclusive right-turn lane. Lane-sharing width is not needed, because waits and queues are usually short, and because it would be unsafe to pass a right-turning vehicle on the right. A 12-foot curb lane may be too narrow, however, for turning truck traffic. In this case the 4 ft that would otherwise be allotted to the bike lane can be distributed between the two lanes, in a 12/14-14 configuration.

Combining left and through movements would increase the average delay per vehicle from 26.0 to 35.5 seconds, although the level of service would remain D. This would, however, require a major retiming of signals to reduce the University Avenue green time by 15 seconds, and should be considered in conjunction with the planned retiming of those signals.

2. South of the intersection, northbound Milvia already has two lanes, one for left turns only and one for combined right and through. There is a good deal of left-turn traffic at this point (at least in the PM peak hour), and combining it with through traffic would increase the delay from 26.0 to 31.8 seconds per vehicle. If both northbound and southbound lanes were reconfigured, the delay would increase to 38.0 seconds.

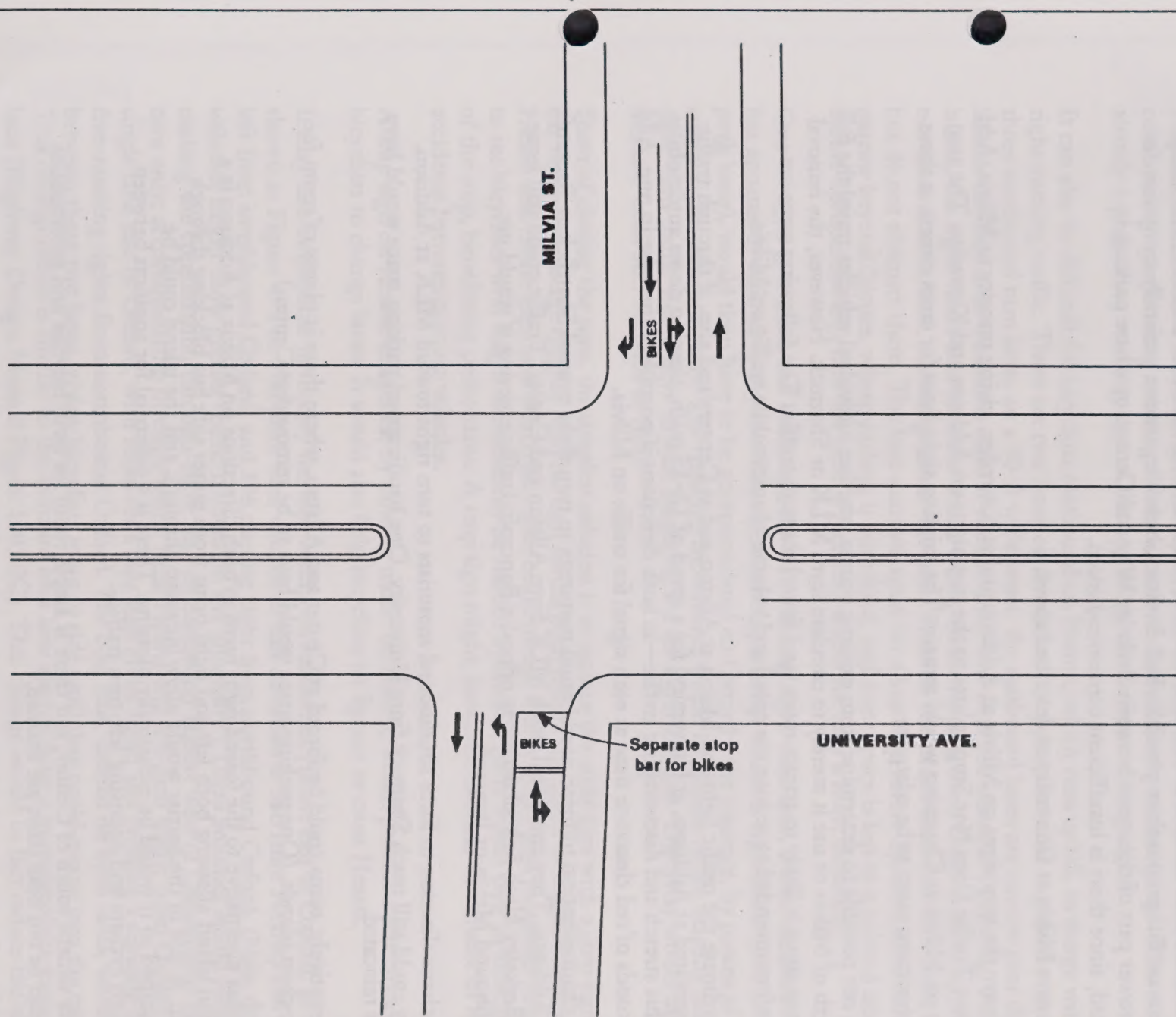
Since there is no parking near the intersection, a third lane could conceivably be added in a 10/10-10-10 configuration. A 10-ft lane is too narrow for lane-sharing but is adequate for queuing in turn lanes; 11 ft is marginal for lane-sharing and 12 ft is acceptable.

European-style separate stop bars for bicyclists and motorists, as in Figure 3, providing an area for through bicyclists to wait in front of right-turning motorists, may work at this intersection, although they would resolve the conflict only for bicyclists arriving on red or willing to wait for it. They may also raise legal questions.

Given the drawbacks to any of these configurations, it may be better to experiment on southbound Milvia before attempting to modify northbound Milvia.

3. Split the signal phase for opposing movements on Milvia. Unfortunately, this would increase the delay to an unacceptable 215 seconds, and cannot be done within the current 70-second cycle length.
4. Prohibit right turns on red from University to Milvia.
5. The recommended signal timing to accommodate bicyclists on Milvia across University (70 ft) is a minimum of 7.5 seconds green, 3 seconds yellow, and 2 seconds all-red. The current timing is fixed at 20, 3, and 0. The minimum green is therefore more than enough, but 2 seconds of all-red should be added to allow bicyclists to clear the intersection.

B9



Not to Scale

City of Berkeley - Berkeley Bicycle Plans
University - Milvia

Prepared By
TJKM

FIGURE
3

Milvia Street Bicycle Boulevard

We have developed the following proposal to turn Milvia from Berkeley Way to Channing into a bicycle boulevard. There is a wide assortment of traffic control measures available, and many variations on this proposal are possible. Full diverters, however, are not generally an option on the narrower part of the street between Berkeley Way and Center, or where parking is permitted, since there is insufficient turnaround room.

1. Improve Milvia at University as described above.
2. Remove the stop signs on Milvia at Addison and at Kittredge, giving priority to Milvia. Add "Cross Traffic Does Not Stop" plates to the stop signs on Addison and Kittredge. The stop sign on Milvia at Channing would remain. The existing sight lines for cross streets at these intersections seem to be adequate.

It is not possible to determine from existing counts whether individual vehicles travel the full length of Milvia or use it merely to circulate from MLK or Shattuck. However, the removal of stop signs is likely to attract more (and faster) through traffic. The following steps are therefore intended to reduce the speed and volume of automobile traffic on Milvia.

3. Coordinate the traffic lights on Milvia at Allston and at Center (and also, if through traffic is permitted at Addison, at University) for a speed of 12-15 mi/h, slowing down automobiles on this stretch and discouraging traffic—in both directions if possible, otherwise in one. Add 2 seconds of red clearance time at each signal for traffic on Milvia.
4. Use channelization to force northbound motorists to turn right toward Shattuck at Bancroft and Addison. They could still reach MLK from Allston and Center. Traffic could still leave the Berkeley High School driveway opposite Bancroft; traffic entering it would use southbound Milvia or Bancroft.
5. Use channelization to force southbound motorists to turn right toward MLK at Addison. They could still reach Shattuck from University. One handicapped parking space would have to be relocated.

Alternatively, turns could be forced at Center and Allston, where there is plenty of room for pork-chop islands. (One parking space would have to be removed at Center.)

Another alternative to the forced right turns in both directions on Milvia at Addison is a median island allowing both left and right turns from either side but blocking through traffic. A slot in the barrier would allow bicyclists through, and the island could be landscaped so it would be esthetically pleasing. There is a potential for conflicts between through cyclists and opposing left-turn traffic.

Milvia widens south of Center, and there is ample room for both bicycles and automobiles whether or not bike lanes are marked.

Oxford and Hearst

Fast traffic in the free-running right-turn lane from northbound Oxford to eastbound Hearst conflicts with pedestrians crossing this lane in the crosswalk to the corner island. There is already a pedestrian warning sign at the beginning of the free-running right.

It can also be difficult for bicyclists eastbound on Hearst, which runs uphill, to merge with the right-turning traffic. There are two lanes eastbound at this point. In order to provide room for three westbound turn lanes on a 50-ft wide street, the eastbound lanes are narrow near the island: the lane near the center is 10 ft wide and the lane near the island is 11 ft wide. Past the island, the right-hand lane becomes much wider; traffic turning from Oxford, however, does not have its own lane, but merges into this lane. Trees on the island interfere with sight lines but do not obstruct them. The lane narrows again for a bus stop before Spruce and remains narrow beyond Spruce, where parking is permitted, and some space is lost to a painted island before Spruce; the area near the curb is therefore usable for only a short distance.

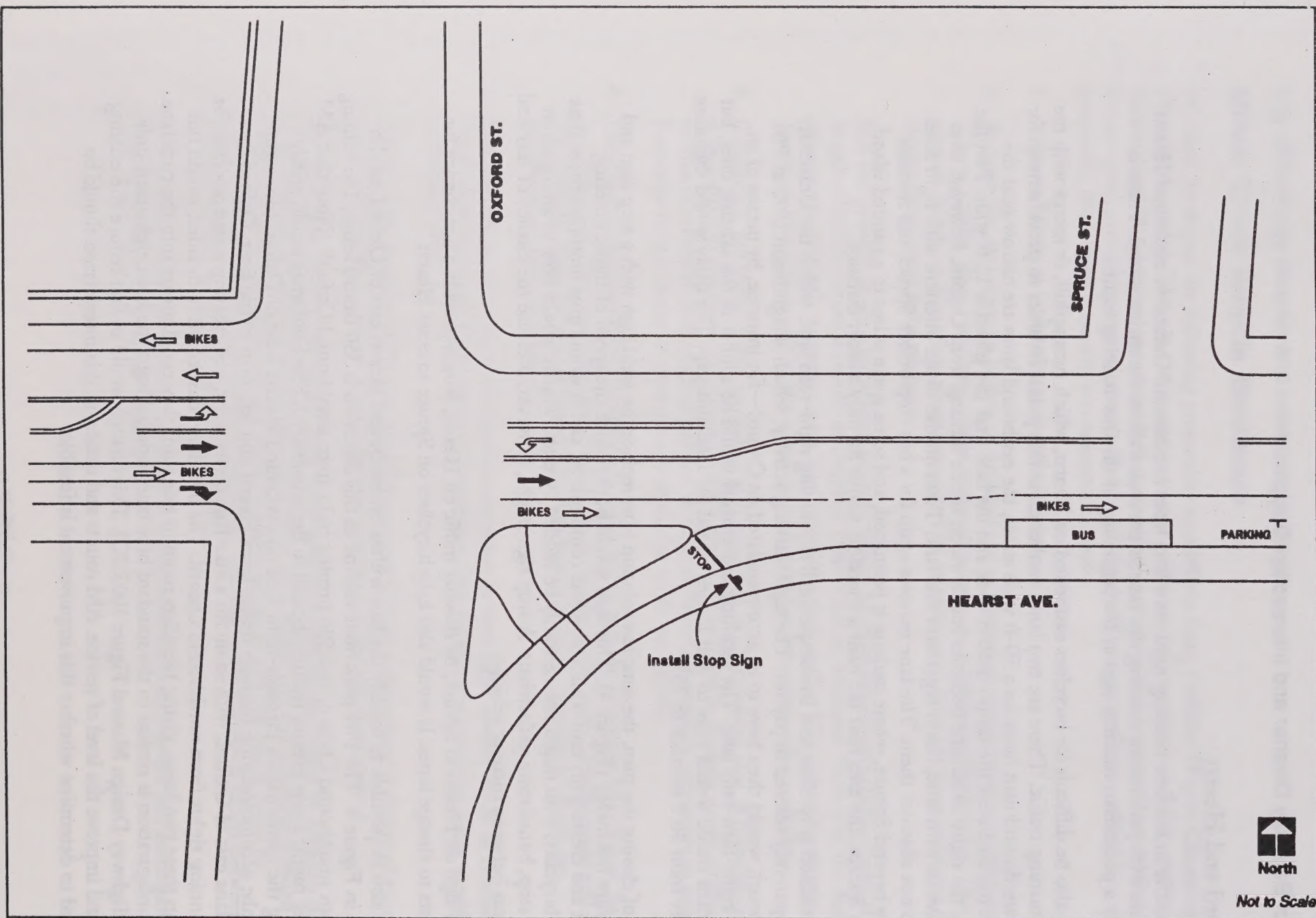
One solution is to close and landscape the free-running right-turn lane, which the University has apparently offered to pay for. The right-turning activity, which is significant (596 at PM peak hour), would then have to be accommodated on Oxford—for instance, by means of an added right-turn-only lane. The resulting movements would be similar to the existing ones, but right-turn traffic would have to wait longer on red for a suitable gap. The delay would therefore increase from 36.9 seconds to 75.0.

Short of closing the turn, the simplest solution is to replace the yield sign with a stop sign and bar before the merge (Figure 4). This sign would both reduce the speed of traffic entering Hearst and create gaps into which bicyclists could merge, and it would give motorists more time to see bicyclists who might momentarily be hidden by trees. Traffic would slow in anticipation of the stop, benefitting pedestrians. A stop sign might, however, increase the chance of rear-end accidents between turning vehicles.

A stop sign on Hearst at Spruce, by slowing traffic on Hearst, would provide a last chance for bicyclists to change lanes. It would also help bicyclists on Spruce to cross Hearst.

It may also be possible to modify the lane widths on eastbound Hearst east of Oxford, as also shown in Figure 4. The PM peak hour volume in this direction is 350 from Hearst, 146 turning left from southbound Oxford, and 596 turning right from northbound Oxford. (Note that AM volumes might show greater traffic inbound to the university.) These volumes would justify making the combination through-right lane on eastbound Hearst west of Oxford into right-turn only; accommodating through traffic from Hearst and left-turn traffic from Oxford in a single lane east of Oxford, with room for a bike lane on its right; and creating a separate lane for free-running rights from northbound Oxford. The bike lane, dashed on both sides, would run between these two lanes, giving bicyclists room to ride until they could merge into the curb lane. This configuration is similar to the standard bike lane approaching a motorist right-turn-only lane (Highway Design Manual Figure 1003.2C). This change would in fact reduce the existing delay and improve the level of service. AM counts and timing at this intersection should be analyzed to determine whether this improvement is feasible.

B/2



City of Berkeley - Berkeley Bicycle Plans
Hearst - Oxford

Prepared By TJKM	FIGURE 4
----------------------------	--------------------

City of Berkeley Diverter and Intersection Design

6. Install a half diverter in the southbound direction just south of Kittredge, preventing through traffic between Allston and Channing. Traffic turning into the Berkeley High School driveway opposite Kittredge would not be affected. Traffic leaving the driveway could not turn right on Milvia but could still turn left on Milvia or cross to Kittredge.
7. An alternative to the forced right on Bancroft and the half diverter is a full diverter between Bancroft and Durant, where Milvia is wide enough for motorists to turn around.

CAPACITY ANALYSIS

Milvia-University

<u>Condition</u>	<u>Delay (secs/vehicle)</u>	<u>LOS</u>
Existing with 2 secs all-red	26.0	D
Southbound lanes changed ¹	35.5	D
Northbound lanes changed ¹	31.8	D
NB+SB lanes changed ¹	38.0	D
Split phase NB/SB ²	215.0	F

Oxford-Hearst

<u>Condition</u>	<u>Delay (secs/vehicle)</u>	<u>LOS</u>
Existing	36.9	D
Eliminate free-right turn	75.0	F
EB lanes changed/allow free-right ³	12.2	B

NOTES

LOS=Intersection Level of Service

Capacity analysis based on PM existing traffic volumes and signal timing.

- 1 = Requires major re-timing of signals to reduce University Avenue green time by 15 seconds.
- 2 = Split-phase NB/SB at Milvia-University cannot be done within current 70 second cycle length.
- 3 = AM counts and timing at Hearst-Oxford must be analyzed to determine whether this improvement is feasible.